

REMARKS

The final Office Action of April 20, 2007, and the Advisory Action of August 14, 2007, have been received and reviewed.

Claims 1-25 are currently pending and under consideration in the above-referenced application, each standing rejected.

Reconsideration of the above-referenced application is respectfully requested.

Rejections under 35 U.S.C. § 102

Claims 1-11 and 15-19 have been rejected under 35 U.S.C. § 102(e) for being drawn to subject matter that is purportedly anticipated by the subject matter described in U.S. Patent 5,972,792 to Hudson (hereinafter "Hudson").

A claim is anticipated only if each and every element, as set forth in the claim, is found, either expressly or inherently described, in a single reference which qualifies as prior art under 35 U.S.C. § 102. *Verdegaal Brothers v. Union Oil Co. of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). The identical invention must be shown in as complete detail as is contained in the claim. *Richardson v. Suzuki Motor Co.*, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

Independent claim 1 recites a substantially abrasive-free slurry for use in polishing a copper structure of a semiconductor device. The slurry is formulated to substantially concurrently polish copper and a barrier material. As amended and presented herein, independent claim 1 requires that the barrier material comprise tungsten. The tungsten is removed at substantially the same rate as or at a slower rate than copper is removed.

Hudson discloses abrasive-free slurries that are useful with fixed-abrasive polishing pads. The slurries of Hudson are useful for planarizing films that have been formed from a variety of materials (*see, e.g.*, col. 22-25), such as tungsten (col. 4, lines 34-49) and copper (col. 4, lines 56-65).

Notably, the slurries of Hudson that are formulated to remove tungsten are much different from the slurries of Hudson that are formulated to remove copper. For example, a slurry that is formulated to remove tungsten is a weak acid (*e.g.*, has a pH of 4.5, or below 5.0) (col. 4, lines 34-41), while a slurry that removes copper is a strong acid (*i.e.*, has a pH of less than

approximately 2.5) or a strong base (e.g., has a pH of more than approximately 10.5) (col. 4, lines 56-59). Moreover, the slurries of Hudson that remove tungsten include one or more of ferric nitrate, hydrogen peroxide, potassium iodate, and bromine (col. 4, lines 36-37), whereas the slurries of Hudson that remove copper include nitric acid and ethanol, nitric acid and benzotriazole, ammonium hydroxide, or ammonia ferricyanide (col. 4, lines 60-65).

Hudson does not expressly or inherently describe a slurry that is formulated to remove both copper and tungsten, let alone a slurry that removes tungsten at substantially the same rate or at a slower rate than copper is removed, as required by amended independent claim 1. Therefore, it is respectfully submitted that Hudson does not anticipate each and every element of amended independent claim 1, as would be required to maintain the 35 U.S.C. § 102(e) rejection against amended independent claim 1.

Each of claims 2-11 and 15-19 is allowable, among other reasons, for depending either directly or indirectly from independent claim 1, which is allowable.

Claim 2 is also allowable since Hudson provides no express or inherent description of a slurry that is formulated for use with a polishing pad that includes fixed aluminum dioxide, titanium dioxide, silicon dioxide, or cerium dioxide abrasive particles.

Claim 3 is additionally allowable since Hudson neither expressly nor inherently describes a slurry that is formulated to oxidize copper at substantially the same rate as or at a faster rate than a barrier material is oxidized.

Claim 4 is further allowable because Hudson does not expressly or inherently describe a slurry in which copper and a barrier material have substantially the same oxidation energies.

Claim 5 depends from claim 4 and is also allowable since Hudson includes no express or inherent description of a slurry in which a barrier material has an oxidation energy of about 0.25 V more to about 0.20 V less than an oxidation energy of copper.

Claim 6 is further allowable since Hudson lacks any express or inherent description of a slurry in which a rate of removal of a barrier material is up to about ten times slower than a rate of removal of copper.

Claim 7 is additionally allowable because Hudson includes no express or inherent description of a slurry in which a rate of removal of a barrier material is about two to about four times slower than a rate of removal of copper.

Claim 8 is also allowable since Hudson neither expressly nor inherently describes a slurry that is formulated to remove copper and a barrier material without substantially dissolving barrier material that underlies remaining portions of copper.

Withdrawal of the 35 U.S.C. § 102(a) rejections of claims 1-11 and 15-19 is respectfully solicited, as is the allowance of each of these claims.

Rejections under 35 U.S.C. § 103(a)

Claims 12-14 and 20-25 stand rejected under 35 U.S.C. § 103(a).

The standard for establishing and maintaining a rejection under 35 U.S.C. § 103(a) is set forth in M.P.E.P. § 706.02(j), which provides:

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Hudson in View of Nakazato

Claims 12-14 and 21-25 stand rejected under 35 U.S.C. § 103(a) for reciting subject matter which is assertedly unpatentable over that taught in Hudson as applied to claim 1 above, and further in view of teachings from U.S. Patent 4,459,216 to Nakazato et al. (hereinafter "Nakazato").

Claims 12-14 and 21-25 are each allowable, among other reasons, for depending directly or indirectly from claim 1, which is allowable.

Moreover, it is respectfully submitted that Hudson teaches away from dissolving conductive material while oxidizing and polishing the same. Col. 4, lines 1-19, and col. 5, lines 55-64. In contrast, Nakazato teaches that “[a]n object of the present invention is to provide a chemical dissolving solution having a good dissolving capacity for various kinds of metal.” Col. 2, lines 33-35. In this regard, the mere fact that Nakazato supplies teachings that are missing from Hudson is insufficient to overcome the fact that Hudson teaches away from the asserted combination. As Hudson teaches away from the asserted combination of its teachings with those of Nakazato, it is respectfully submitted that one of ordinary skill in the art wouldn’t have been motivated to combine the teachings of these references in the asserted manner.

Therefore, a *prima facie* case of obviousness has not been established against any of claims 12-14 and 21-25 under 35 U.S.C. § 103(a).

Hudson in View of Suzuki

Claim 20 stands rejected under 35 U.S.C. § 103(a) for reciting subject matter which is allegedly unpatentable over the subject matter taught in Hudson and, further, in view of teachings from U.S. Patent 5,885,334 to Suzuki et al. (hereinafter “Suzuki”).

Claim 20 is allowable, among other reasons, for depending indirectly from claim 1, which is allowable.

It is respectfully requested that the 35 U.S.C. § 103(a) rejections of claims 12-14 and 20-25 be withdrawn, and that each of these claims be allowed.

CONCLUSION

It is respectfully submitted that each of claims 1-25 is allowable. An early notice of the allowability of each of these claims is respectfully solicited, as is an indication that the above-referenced application has been passed for issuance. If any issues preventing allowance of the above-referenced application remain which might be resolved by way of a telephone conference, the Office is kindly invited to contact the undersigned attorney.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Brick G. Power", with a horizontal line extending to the right.

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Date: September 14, 2007
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Document in ProLaw